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Pressure Effect on the Curie Points of the Compounds $CuCr_2X_4$ (X=S, Se, Te) and MPt_3 (M=Cr, Mn, Co)*

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Abstract

The pressure effect on the Curie temperatures of the compounds $CuCr_2X_4$ (X= S, Se, Te) and MPt_3 (M=Cr, Mn, Co) were investigated.

Among the compounds of the type $CuCr_2X_4$ (the crystal structure of these compounds are of spinel type), the pressure coefficients of the Curie points of $CuCr_2S_4$ and $CuCr_2Se_4$ are negative, while that of $CuCr_2Te_4$ is small (not detectable):

$$\frac{1}{T_c}\frac{\partial T_c}{\partial p} = -3.1\times10^{-6}\ \text{bar}^{-1}\ \text{for}\ CuCr_2S_4,$$

$$-1.0\times10^{-6}\ \text{bar}^{-1}\ \text{for}\ CuCr_2Se_4$$

$$\text{and} \simeq 0\ \text{for}\ CuCr_2Te_4.$$

In these compounds the nearest neighbour interaction between a pair of Cr ions at B-sites is considered to consist of both antiferromagnetic direct exchange interaction and ferromagnetic superexchange interaction. Hence the negative values of $\partial T_c/\partial P$ should be attributed to the strengthening of antiferromagnetic direct interaction.

On the other hand, the intermetallic compounds MPt_3 have an ordered structure of Cu_3Au type. The pressure coefficients of the Curie points are as follows:

$$\frac{1}{T_c}\frac{\partial T_c}{\partial p} = 1.4\times10^{-6}\ \text{bar}^{-1}\ \text{for}\ CrPt_3,$$

$$2.5\times10^{-6}\ \text{bar}^{-1}\ \text{for}\ MnPt_3$$

$$\text{and} \simeq 0\ \text{for}\ CoPt_3.$$

The results are discussed in connection with Sato's analysis for the interactions in those compounds. Forced magnetostriction of CoPt compound were measured in the temperature range between the room temperature and 4.2 K. Its forced magnetostriction coefficients are negative.

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